

The invention also offers the advantage that it is susceptible of various modifications. Thus, the shape of the markers is not limited to rectangles, and instead other shaped markers may be used. Also the marker display circuits can be modified so as to increase or decrease the length of time the markers are displayed and also to change the vertical positions of the markers on the TV monitor screen. Different forms of imaging devices also may be used. For example, the imaging component of the invention may utilize a BBD semiconductor imaging device rather than a CCD solid state element, as suggested by U.S. Pat. No. 4,488,039. Similarly, the number of lenses in the objective lens unit and also in the zoom lens unit may be changed without affecting operation of the invention.

Other possible modifications and advantages of the invention will be obvious to persons skilled in the art.

What is claimed is:

1. An endoscope apparatus comprising:
  - a handle assembly;
  - a tube having a distal end and a proximal end, said tube being mounted within said outer tube and having its proximal end anchored to said handle assembly;
  - an objective lens unit mounted in the distal end of said tube;
  - a shaft having a distal end and a proximal end, said shaft being disposed within and movable along the axis of said tube;
  - a solid state imaging device disposed within said tube and attached to said distal end of said shaft so as to be movable therewith along the axis of said tube, said imaging device having a light receiving surface for receiving an image transmitted by said objective lens unit and being capable of generating an output signal representative of the image transmitted by said objective lens unit;
  - a zoom lens unit disposed within said tube between said objective lens unit and said imaging device for transmitting images seen by said objective lens unit to said imaging device, said zoom lens unit being moveable along the axis of said tube relative to said objective lens unit so as to cause the magnification of the image passed by said objective lens unit to be changed in accordance with the axial position of said zoom lens unit in relation to said objective lens unit;
  - first and second drive means attached to said handle assembly;
  - a first motion-transmitting means coupling said first drive means to said shaft, whereby operation of said first drive means will cause axial movement of said imaging device relative to said objective lens unit;
  - a second motion-transmitting means coupling said second drive means to said zoom lens unit whereby operation of said second drive means will cause axial movement of said zoom lens unit relative to said objective lens unit and said zoom lens unit;
  - control means for operating said first and second drive means;
  - display means responsive to said imaging device output signal for generating a video reproduction of the image passed by said objective lens unit; and
  - electronic means responsive to said imaging device output signal for causing said display means to generate a video image representative of the position of at least said zoom lens unit or said imaging device.
2. Apparatus according to claim 1 wherein said electronic means is adapted to cause said display means to generate a

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video image representative of the positions of both said zoom lens unit and said imaging device.

3. Apparatus according to claim 1 wherein said zoom lens unit is movable between a first minimum position and a second maximum position, and said electronic means is adapted to cause said display means to generate a first image representative of said minimum position of said zoom lens unit and a second image representative of said maximum position of said zoom lens unit.

4. Apparatus according to claim 3 wherein said electronic means is adapted to cause said display means to generate an additional image representative of the instantaneous position of said zoom lens unit.

5. Apparatus according to claim 1 wherein said imaging device is movable between a first minimum position and a second maximum position, and said electronic means is adapted to cause said display means to generate a first image representative of said minimum position of said imaging device and a second image representative of said maximum position of said imaging device.

6. Apparatus according to claim 5 wherein said electronic means is adapted to cause said display means to generate an additional image representative of the instantaneous position of said imaging device.

7. An endoscope apparatus comprising:

a handle assembly;

an outer tube having a distal end and proximal end, with said proximal end anchored to said handle assembly;

an inner tube having a distal end and a proximal end, said inner tube being mounted within said outer tube and having its proximal end anchored to said handle assembly;

an objective lens unit mounted in the distal end of said inner tube;

a shaft having a distal end and a proximal end, said shaft being disposed within and movable along the axis of said inner tube;

a solid state imaging device disposed within said inner tube and attached to said distal end of said shaft so as to be movable therewith along the axis of said inner tube, said imaging device having a light-receiving surface for receiving an image transmitted by said objective lens unit and being capable of generating an output signal representative of the image transmitted by said objective lens unit;

a zoom lens unit disposed within said inner tube between said objective lens unit and said imaging device, said zoom lens unit being moveable along the axis of said inner tube relative to said objective lens unit so as to cause the magnification of the image passed by said objective lens unit to be changed in accordance with the axial position of said zoom lens unit in relation to said objective lens unit;

first and second drive means attached to said handle assembly;

171, 173, ± a first motion-transmitting means coupling said first drive means to said shaft, whereby operation of said first drive means will cause axial movement of said imaging device relative to said objective lens unit;

a second motion-transmitting means coupling said second drive means to said zoom lens unit whereby operation of said second drive means will cause axial movement of said zoom lens unit relative to said objective lens unit and said zoom lens unit;

18 E I a space between said outer and inner tubes; light transmitting means in said space for transmitting light to illuminate an object viewed by said objective lens unit;

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a plurality of light-transmitting fibers disposed between said inner and outer tubes, said fibers extending substantially to the distal end of said inner tube so that light transmitted thereby will illuminate the objective field;

first bi-directional electromechanical means for moving  
 said zoom lens unit along said inner tube toward or  
 away from said objective lens unit, said first electro-  
 mechanical means comprising a first reversible electri-  
 cal motor having an output shaft and first gear means  
 coupling said output shaft to said zoom lens unit, 5  
 whereby energization of said first motor will cause  
 movement of said zoom lens unit along said inner tube  
 according to the mode of energization of said motor;  
 and

second bidirectional electromechanical means for moving 10  
 said imaging device along said inner tube toward or  
 away from said objective lens unit and said zoom lens  
 unit, said second electromechanical means comprising  
 a second reversible electrical motor having an output  
 shaft and second gear means coupling the output shaft 15  
 of said second electrical motor to said imaging device,  
 whereby energization of said second motor will cause  
 movement of said imaging device along said inner tube  
 according to the mode of energization of said second  
 motor; 2

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10 display means responsive to said imaging device output  
signal for generating a video reproduction of the image  
passed by said objective lens unit; and  
means responsive to said imaging device output signal for  
15 causing said display means to generate a video image  
representative of the position of at least said zoom lens  
unit or said imaging device.

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